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[54] MICROWAVE PLASMA PROCESSING APPARATUS AND METHOD THEREFOR

[75] Inventor: Nobumasa Suzuki, Yokohama, Japan

[73] Assignee: Canon Kabushiki Kaisha, Japan

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Primary Examiner—Robert Kunemund
Assistant Examiner—Luz Alejandro
Attorney, Agent, or Firm—Fitzpatrick, Cella, Harper & Scinto

[57] ABSTRACT

For generating uniform high-density plasma over a large area with a low power thereby achieving high-quality plasma process at a high speed even at a low temperature, there is provided a microwave plasma processing apparatus comprising a plasma generation chamber having a periphery separated from the ambient air by a dielectric member, microwave introduction means utilizing an endless annular wave guide tube provided around the plasma generation chamber and provided with plural slots, a processing chamber connected to the plasma generation chamber, support means for a substrate to be processed provided in the processing chamber, gas introduction means for the plasma generation chamber and the processing chamber, and evacuation means for the plasma generation chamber and the processing chamber, wherein the circumferential length L_g of the endless annular wave guide tube, the wavelength λ_g of the microwave in the endless annular wave guide tube, the circumferential length L_s of the dielectric member and the wavelength λ_s of the surface wave propagating in the dielectric material substantially satisfy a relationship:

$$L_s/\lambda_s=(2n1)L_g/\lambda_g$$

wherein n is 0 or a natural number.

59 Claims, 9 Drawing Sheets